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HEARTBEAT MONITORING OVER INTERNET USING ARDUINO AND THINGSPEAK

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ABSTRACT
Heart disease is a severe problem in today's world. It is the leading cause of death, and it is also the leading cause of disability. It is essential to get checked and take immediate action during critical conditions. This paper proposes Heartbeat Monitoring over the Internet using Arduino and ThingSpeak. The designed IoT system is integrated with the heartbeat detector and automatically updates the heartbeat of the patient over the Internet. The patient's heart rate is measured via optical technology by detecting the blood flow via the index finger. The pulse from the fingertip is detected in three phases: detecting the pulse, extracting the signal, and lastly analyzing the signal. The system will display beats per minute (BPM) on the LCD. Then the data is sent to the ThingSpeak via the Internet and the heart rate data in the graph form will be displayed in ThingSpeak, which is a greater source to display the data online as the user enable to access the data from ThingSpeak at any time at any place.The application allows the user to upload their data to their personal cloud storage or some medical cloud so that the data can be easily monitored by the doctor and can be easily retrieved whenever deemed necessary. Therefore, the heart rate can be monitored from anywhere in the world.

INTRODUCTION
Heart disease refers to any condition affecting the heart. There are many types, some of which are preventable. The health problems such as cardiac failure, lung failure, and heart-related disease are increasing day by day at a very high rate. Continuous health monitoring is very important to solve these problems. Health monitoring systems based on modern bioelectrical technologies can care the patient from the remote place wirelessly via the internet They are essential roles in the improvement of the medical area. Cheap monitoring systems are providing more comfortable living to people suffering from various diseases by using leading technologies such as wireless communications, and wearable and portable remote health monitoring devices. Because the information regarding the patient's health directly displays onthe doctor's monitor screen from anywhere the patient resides, the visit of doctors to the patients constantly can be decreased Thus, the doctor can view the patient's current pulse rate via a web page using ThingSpeak.

A. The Objectives of the System
The main purposes of this system are the followings:

- to design and develop a device that continuouslymonitors the vital indicators as it periodically monitors and measures heart rate
- to design a low-cost device that measures the heart rate
- to observe the heart rate singles in the present time by using the ATmega 328 microcontroller
- to reduce the death rate due to the heart disease
- to monitor the patient remotely over the internet

B. The Advantages of the System

- IoT monitoring proves really helpful when we need to monitor and record and keep track of changes in the patient's health parameters over time. In the IoT health monitoring system, doctors can

take the reference of these changes or the history of the patient while suggesting treatment or medicines to the patient.

- Hospital stays are minimized due to remote patient monitoring.
- Hospital visits for normal routine checkups are minimized.

LITERATURE SURVEY

In this Project, heart-rate signals were collected from fingers or ears using IR TX-RX(Infrared Transmitter and Receiver pair) module which was amplified in order toconvert them to an observable scale. A low-pass filter was used to filter inherentnoise. The signals were counted by a microcontroller module (ATmega8L) anddisplayed on the LCD. Microcontroller is programmed with an algorithm to run theproposed heart rate counting system.

The results obtained using this process when compared to those obtained fromthe manual test involving counting of heart rate were found satisfactory. The proposedsystem is applicable for family, hospital, community medical treatment, sportshealthcare, and other medical purposes. Also, fit for adults and pediatrics.

However, this method in the developed system needs further investigation and needmore functionality, which may be useful to consider advance in future research.This project includes working on a wireless display of Heartbeat and temperaturebased on a microcontroller A Tmega328 (Arduino Uno). Most monitoring systemsthat are used in today's world work in offline mode but our system has been designed in such a way that a patient is monitored remotely in real-time. This systemconsists of sensors thatmeasurethe heartbeat and body temperature of a patientwhich is controlled by the microcontroller. Both parameters are displayed onan LCDmonitor. The transmitted data is wireless and is sent through a microcontroller.

Heartbeat is counted through a pulse sensor in Beats per Minute while the temperaturesensor measures temperature and both the data are sent to the microcontroller fortransmission to receiving end. Finally, the data are displayed at the receiving end.This system could be made available at a reasonable cost with great effect andaccuracy.

In this project implementation of heartbeat monitoring and heart attack detectionSystems inthe Internet of Thingsare shown. These days we saw an increased numberof heart diseases& heart attacks. The sensor is interfaced with a microcontroller thatallows checking heart rate readings and transmitting them over the internet. The usermay set the level of heartbeat limit. After setting these limits, the system startsmonitoring and as soon as the patient'sheartbeat goes above a certain limit,the system sends an alert to the controller which then transmits this over the internet and alertsthe doctors as well as concerned users. Also, the system alerts for lower heartbeats.

Whenever the user logs on for monitoring, the system also displays the live heart rateof the patient. Thus, concerned patients may monitor their heart rate as well as get an alert of a heart attack to the patient immediately from anywhere and the person can be saved on time.

In this research paper, the design and development of a microcontroller-based heartbeat and body temperature monitor using a fingertip and temperature sensor isshown. This device involves the use of optical technology to detect the flow of blood through the finger and offers the advantage of portability over conventionalrecording systems. Wireless body Area network-based remote patient monitoring systems have been presented with numerous problems including efficient data extraction and dynamic tuning of data to preserve the quality of data transmission. Evaluation of the device on real signals shows accuracy in heartbeat measurement, even under intense physical activity.

The device consists of sensors that are used to measure the heartbeat as well as the body. The temperature of a patient is controlled by a central unit. The readings from these sensors are further processed and sent via the GSM module. The optical heartbeat sensor counts the heartbeat per minute and the temperature sensor measures the temperature of the body, both the measured is shown that the

heart rate can be measured by monitoring one's pulse using specialized medical devices such as anelectrocardiograph (ECG), portable wriststrap watch, or any other commercial heart rate monitors. Despite its accuracy, somehow it is costly and involves manyclinical settings and patients must be attended to by medical experts for continuousmonitoring.
The results obtained using this process when compared to those obtained from themanual test involving counting of heart rate were found satisfactory. The proposedsystem is applicable for family, hospital, community medical treatment, sports, healthcare, and other medical purposes. Also, fit for adults and pediatrics.
However, this method in the developed system needs further investigation.

PROPOSED SYSTEM

Arduino Uno is one of Arduino's microcontroller boards based on the ATmega328 microcontroller from Atmel "Uno" implies the latest in a series of USB, Universal Serial Bus, in Italian and UNO boards. Meanwhile, The Arduino panel is the reference system for the Arduino platform.
The pulse sensor is an Arduino heart rate plug-and-play sensor. It can be used by learners, artists, athletes, game developers, and developers of mobile devices who want to incorporate live cardiac information into projects readily. It is an integrated circuit of optical amplification and a noise suppression sensor. The heart sensor can be attached to the earlobe or finger of the human body and inserted into the Arduino.
The ESP8266 is a user-friendly and low-cost tool for connecting your projects to the Internet. The module can function as both a point of access and a station. It can readily collect and download information over the Internet, making Internet items as easy as possible. It can also extract data from the Internet using APIs, enabling your project to access all information on the Internet and make it smarter. Another interesting characteristic of this module is that it can be programmed using the Arduino IDE. The ESP8266 module works with 3.3V only, if we provide more than 3.7V would burn the module hence be cautious with your circuits.
LCD is a liquid crystal display. The LCD used here is 16 alphanumeric LCDs, which implies that alphabets and numbers can be displayed on 2 rows each with 16 characters. It is used to show the status of the gas leak. It can be used to show all the different alternatives and measurements stored in the EEPROM.
In this system, hardware implementation and software implementation are interfaced to design this heart rate monitoring system based on the embedded system.
Firstly, the pulse sensor is attached to any organ of the body where it can detect the pulse easily like a finger. Then the used sensor measures the change in the volume of blood, which occurs when every time blood in the body is pumped by the heart. The light intensity through the organ of the body changes corresponding to the change in the volume of blood in that organ. The software then converts this change into beats per minute (BPM). The LED which is connected at pin 13 also blinks per the heartbeat. The pulse sensor has three pins. Connect VCC and the ground pin of the pulse sensor to the 5V and the ground of the Arduino and the signal pin to the A0 of Arduino.
ESP8266 requires 3.3V and if the Arduino Uno board provides it with 5V then it will not function properly and it might get damaged. Connect the CH PD and the VCC to the 3.3V pin of Arduino. The RX pin of ESP8266 requires only 3.3V and it does not respond to the Arduino when it is connected directly to the Arduino. So, a voltage divider for it is made which converts the 5V into 3.3V. This can be done by connecting three resistors arranged in series. Connect the TX pin of the ESP8266 to pin 9 of the Arduino and the RX pin of the ESP8266 to pin 10 of the Arduino through the resistors.
Thing Speak is a nice instrument and offers system equipment based on IoT. The information can be tracked and controlled via the Internet using the ThingSpeak website's channels and web pages. Firstly, registration is needed to create a ThingSpeak account on the ThingSpeak ate, https/thing speak.com,

as described. A ThingSpeak account was created, channels were clicked, and a new channel and field name was created. Do the checkmark in the check box at the bottom of the form to choose "Make public" save the channel and generate the new channel. The new channel has been created, and the API keys are onthe ThingSpeak site. Then select the API key to duplicate the Write API key. It will be needed in the program. API keys are required to modify the program and they are necessary to set the information.

CONCLUSION

Heart Beat Monitoring System is used in hospitals and wherever ThingSpeak is used. The sensor of the pulse is linked to the human body. It is possible to detect the pulse, the pulse sensor measures the changes in the blood volume. Arduino transforms the heartbeat per minute and displays the text about the heart rate "BPM" on the LCD. The ESP8266 will configure with Arduino and send the information to ThingSpeak to obtain the code and display the outcome using the Arduino-connected graph and the outcome (BPM). will also be displayed. The heartbeat taken is shown on the LCD monitor at ThingSpeak and displayed on the internet.

FUTURE SCOPE

The heartbeat GPS module can be added to this IoT-based heart rate monitoringsystem. It can searchthe location of the patient with the position of the longitudeand latitude. Then GPS module will send this location of the patient to the webserver on the cloud as it is used by the Wi-Fi module. Then doctors enable to knowthe location of the patient when they have to need any preventative actions.
The current version of the processing application displays the near-time PPG heartrate but does not record anything. Here is a lot of room for improvement. Loggingheart rate measurements and PPG samples along with the time-stamp informationavailable from the PC. Beeping sound alarm for heart rates below or abovethe threshold. Heart rate trends over time, etc.

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